

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently amended) A sliding structure of a shaft member in which a shaft member is retained slidably in a guide hole, wherein a plurality of labyrinth grooves are formed in both axial end portions of the side surface of the shaft member which are located in an area, which are always in slidable contact with a side surface of the guide hole, and wherein an intermediate portion of the shaft member between said axial end portions has a substantially constant outer diameter that is free of grooves.

2. (Currently amended) An injector having a needle which has a needle is inserted into a nozzle supplied with a fuel for injection, is made up of a shaft member retained slidably in a guide hole formed in the nozzle wall and is displaced in the axial direction to switch between fuel injection and termination of fuel injection;

wherein a structure in which the needle is retained slidably in a guide hole formed in the nozzle wall plurality of labyrinth grooves are formed in both axial end portions of the side surface of the shaft member which are located in an area, which are always in slidable contact with a side surface of the guide hole, and

wherein an intermediate portion of the shaft member between said axial end portions has a substantially constant outer diameter that is free of grooves; or

a structure in which a valve chamber provided with a valve body for isolating a back pressure chamber from a low pressure source is provided in a low pressure flow path for releasing to the low pressure source the fuel in the back pressure chamber to which a high pressure fuel is supplied and which generates a back pressure to the needle, and a piston which is made up of a shaft member and presses the valve body

~~into the guide hole penetrating through the wall of the valve chamber, is retained, has the sliding structure of a shaft member set forth in claim 1.~~

3. (New) The sliding structure as set forth in claim 1, wherein a distance between an end of the shaft member and a first groove of the labyrinth grooves nearest to the end of the shaft member is 0.1 to .8 mm.

4. (New) The sliding structure as set forth in claim 1, wherein a groove pitch of the labyrinth grooves is 0.1 to 1.0 mm.

5. (New) The sliding structure as set forth in claim 1, wherein the number of the labyrinth grooves at each end portion is 3 to 5.

6. (New) The sliding structure as set forth in claim 1, wherein a groove width of the labyrinth grooves is equal to or less than 0.6 mm.

7. (New) The sliding structure as set forth in claim 1, wherein said intermediate portion has an axial length greater than an axial length of either of said grooved axial end portions.

8. (New) The injector as set forth in claim 2, wherein a distance between an end of the shaft member and a first groove of the labyrinth grooves nearest to the end of the shaft member is 0.1 to .8 mm.

9. (New) The injector as set forth in claim 2, wherein a groove pitch of the labyrinth grooves is 0.1 to 1.0 mm.

10. (New) The injector as set forth in claim 2, wherein the number of the labyrinth grooves at each end portion is 3 to 5.

11. (New) The injector as set forth in claim 2, wherein a groove width of the labyrinth grooves is equal to or less than 0.6 mm.

12. (New) The injector as set forth in claim 2, wherein said intermediate portion has an axial length greater than an axial length of either of said grooved axial end portions.

13. (New) An injector having a needle, which is inserted into a nozzle supplied with a fuel for injection and is displaced in the axial direction to switch between fuel injection and termination of fuel injection,

a valve chamber provided with a valve body for isolating a back pressure chamber from a low-pressure source provided in a low-pressure flow path for releasing to the low-pressure source the fuel in the back pressure chamber, to which a high-pressure fuel is supplied and which generates a back pressure of the needle, and

a piston, which is made up of a shaft member and presses the valve body, and is retained slidably in a guide hole, wherein a plurality of labyrinth grooves are formed in both axial end portions of the side surface of the shaft member which are located in an area, which are always in slidable contact with a side surface of the guide hole, and wherein an intermediate portion of the shaft member between said axial end portions has a substantially constant outer diameter that is free of grooves.

14. (New) The injector as set forth in claim 13, wherein a distance between an end of the shaft member and a first groove of the labyrinth grooves nearest to the end of the shaft member is 0.1 to .8 mm.

15. (New) The injector as set forth in claim 13, wherein a groove pitch of the labyrinth grooves is 0.1 to 1.0 mm.

16. (New) The injector as set forth in claim 13, wherein the number of the labyrinth grooves at each end portion is 3 to 5.

17. (New) The injector structure as set forth in claim 13, wherein a groove width of the labyrinth grooves is equal to or less than 0.6 mm.

18. (New) The injector as set forth in claim 13, wherein said intermediate portion has an axial length greater than an axial length of either of said grooved axial end portions.